Exhibit 1
Proposed Sanitary Sewer Collection System Analysis Data Form

Development: _____ Consultant: _____

Sewer line # or ID	Material	Size In.	Length Feet	Slope (%)	Upstream Manhole			Downstream Manhole		
					#	Invert Elev.	Ground Elev.	#	Invert Elev.	Ground Elev.

Engineer Name:_____ **Date:**_____

Exhibit 2

Proposed Water System Inventory Data Form

Development_____

Consultant _____

Material	Size Pipe & Valve	Length of Pipe	Number of Valves	Number of Fire Hydrants
	2"			
	4"			
	6"			
	8"			
	10"			
	12"			
	14"			
	16"			
	20"			
	24"			
	36"			
	48"			

Engineer Name_____Date_____

Exhibit 3

Sizing and Selection of Water Meters

Intent: This standard is intended to be used as a guideline in sizing and selecting water meters for all services connected to systems owned and/or operated by the City of Savannah. Although, this standard will not cover every situation which may be encountered in the sizing and selecting of water service meters, it is applicable to the majority of installations within the areas served by the City of Savannah. This guide is not intended to preclude the knowledge and experience of the engineer, nor does it relieve the engineer from the responsibility to use good engineering practice in sizing and selecting of water service meters. However, where a valid engineering basis cannot be provided to show just cause to vary from this guide, it shall be used as the criteria for design. Design engineers are requested to refer to AWWA Manuals M6, and M22 and AWWA Standards C700, C701, and C702.

Basis: The basis for this guide is taken from the above references.

The Safe Maximum Operating Capacity given in AWWA C700 (Table 1) was used directly as the "Maximum Operational Limit" for each given size of positive displacement meter.

The Minimum Adjusted Average Daily Flow has been set as a minimum of 15 percent of the "Safe Maximum Operating Capacity" of Class II turbine meters as specified in AWWA C701.

The equation for determining "Adjusted Average Daily Flow" was developed to account for high peaks of limited duration.

Meter Sizing: Although, service lines may be sized to accommodate anticipated long term growth, service meters shall be sized for initial conditions plus a minimum of 12 months anticipated growth.

Meter Selection: Meters shall be selected on the basis of flow rate as follows:

Sustained Low Flows (Positive Displacement Meter)

- All single residential units including single family residences, duplexes, triplexes, quadraplexes, apartments, and condominiums with individual unit meters shall use a positive displacement meter.

Exhibit 3 continued:

- **!** Use of positive displacement meters in other residential, commercial, industrial or institutional developments shall be limited by the "Maximum Operational Limit" for peak and/or average daily flow as shown below.

Maximum Operational Limit

Meter Size	Safe Maximum Operating Capacity (gpm)	Recommended Maximum Rate for Continuous Operation (gpm)
5/8"	20	10
1"	50	25
1 1/2"	100	50

Sustained High Flows (Turbine Meters)

Use of turbine meters shall be reserved for sustained high flows and shall be limited by the following:

Minimum Adjusted Average Daily Flow (AADF**)**

Meter Size	Minimum Adjusted ADF (gpm)
1 1/2"	30
2"	30
3"	113
4"	188
6"	375
8"	450

Adjusted Average Daily Flow (AADF) shall be calculated using the following equation:

AADF (gpm) = [ADF (gpd) - ADF (gpm) x Fp x 60 x n] / 1440

where: Fp = Peaking factor*

N = Total duration of peaking in a 24 hour period expressed in units of hrs./day.

*Minimum peaking factor shall be 3.0 unless specific information is available. Where peaking factor adjustment is desired, the engineer shall submit calculations and basis for adjustment for approval.

Exhibit 3 continued:

Example: A 250 unit apartment complex is to be served with a master meter. It has been determined that a 4" service and meter are required. Can a turbine meter be used?

Assume: Average daily flow = 300 gal/unit/day
Peak Flows occur 6:00 a.m. - 8:00 a.m and 5:00 p.m. - 8:00 p.m.

ADF(gpd) = 300 gal/unit/day ?250 units = 75,000 gpd
ADF (gpm) = 75,000 gpd/1440 = 52 gpm
Fp = 3.0
N = 2 hrs. (am) + 3 hrs. (pm) = 5 hrs/day

AADF (gpm) = [75,000 gpd - (52 gpm ?3 ?60 min/hr ?5 hrs/day)]/ 1440
= [75,000 gpd - 46,800 gpd] / 1440
= 19.6 gpm

Minimum adjusted average daily flow for a 4" turbine meter is 188 gpm.
Therefore, a turbine meter cannot be used.

Intermediate and/or Variable Flows (Compound Meters)

Applications with peak flow above the maximum operational limits given for positive displacement meters or below the minimum adjusted average daily flows shall require a compound meter.

Exhibit 4
Proposed Water Distribution System Analysis Data Form

Development:_____ Consultant:_____

Water line # or ID	Material	Size In.	Length Feet	"C"	Peak Hourly Flow		Max. Day +Fire Flow		Elevation			
					PSI	GPM	GPM	PSI	Node	Ground	HGL_1	HGL_2

HGL_1 = Hydraulic Grade Line at Peak Hourly Flow
HGL_2 = Hydraulic Grade Line at Maximum Day + Fire Flow

Engineer: _____ Date: _____

Exhibit #5

CITY OF SAVANNAH - WATER and SEWER BUREAU
P. O. Box 1027 • Savannah, Georgia 31402 • 912-651-6573 • FAX 912-650-7839

FIRE SYSTEM AND BACK FLOW PREVENTION DEVICES
OWNER/CLIENT DECLARATION

1. The owner/client will be responsible to maintain and operate the fire system from the tapping valve up to and including the back flow prevention device, along with the internal fire system.

2. The owner/client has responsibility to operate and maintain the backflow prevention devices at subject location, and to include testing on an annual basis of the devices as required by the City of Savannah Water Operation Cross Connection Policy. The back flow devices are the property of the owner/client and the City will not be liable for any flooding that may occur from any back flow devices installed on the premises. If City owned water meters are permitted for inside installation, it shall be the owner/client's liability for any flooding that may occur.

Mark where applicable:

? Fire system

? Fire system back flow device
Exact location of installation: _____

? Domestic system back flow device
Exact location of installation: _____

? Irrigation system back flow device
Exact location of installation: _____

Site Address: _____

Owner/Client Name (Please Print): _____

Owner/Client Address: _____

Phone: _____ Fax: _____

Signature of Acceptance: _____ Date: _____

Exhibit 6

Sanitary Sewer Extension Submittal
City of Savannah

Submitted for review pursuant W. Q. Rules section 391-3-6.02 (3) (a) are this form and (as applicable)

[x] Plans (one copy)
[x] Specifications (one copy)
[ ] Certified Statement that the proposed sanitary sewers and/or water lines are not constructed on or serving structures or proposed to be constructed on solid waste landfills.

1A. Project name or identification:
_____

1B. Design Firm: _____
Mailing Address: _____
_____

1C. Design Engineer (s) : _____
Georgia P.E. # _____ Expiration Date: _____

1D. Name of the Georgia P.E. that project inspector will report to:
_____ Georgia P.E.# _____

2. Name of Developer: _____
Mailing Address:_____
City, County, State, Zip Code: _____
_____

3A. Proposed service area (this project)
Immediate _____ acres Ultimate _____acres

3B. Type of developments: (check as applicable)
Industrial _____ Residential _____ Commercial _____
Other _____ (explain)

3C. Population to be served:
Population _____ Density/acre _____

3D. Per capita wastewater contribution:
Average _____ GPD Peak _____ GPD

Exhibit 6 continued:

3E. If receiving industrial wastewater, describe industrial waste characteristics.

_____

_____

_____

_____

Quantity _____GPD. Describe pretreatment (if any)

_____

(Use attachments as needed)

4A. Average design flow (this project) _____GPD Peak _____GPD

4B. Design BOD (this project) Average _____lbs/day

4C. List nominal pipe diameters and length:

_____

_____

_____

4D. No., size and type of pump stations (if any)

_____

_____

Note: design calculations must be submitted with this form.

5. Wastewater treatment plant to which extensions are tributary
Name: _____

Permit Flow:_____ MGD Permit # _____

Name	Permit Flow	Permit #
President Street WQCP	27.0 MGD	GA 0025348
Georgetown WQCP	2.45 MGD	GA 0046418
Wilshire WQCP	4.50 MGD	GA 0020443
Travis Field WQCP	1.50 MGD	GA 0020427

Exhibit 7

Equivalent Residential Unit (Eru) Calculation Sample

The following illustration is designed to compute the total number of equivalent residential units (ERUs), as well as, total water and sewer fees.

Example: A developer wishes to construct a 150-room motel with two commercial laundry machines in the Gateway Service area. The worksheet would be completed as shown on Attachment A.

PROJECT 150-Room Motel **DATE:**_____

LOCATION Gateway, Highway 204

Flow rates are determined by the water use standards.

Residential Use: Equivalent Residential Units (ERU)

Total number of single family homes	____ @ 300 gpd = _____ GPD
Total number of one bedroom apartments	____ @ 150 gpd = _____ GPD
Total number of two bedroom apartments	____ @ 200 gpd = _____ GPD
Total number of three bedroom apartments (4 or more units per parcel)	____ @ 300 gpd = _____ GPD
	Total GPD_____
	Divide by 300 gpd (1 ERU)
	= Total ERUs_____

Commercial Use: Gallons Per Day (GPD)

Offices:	30 gallons/200 sq. ft. =	_____ GPD
Department Store/Retail:	5 gallons/100 sq. ft. =	_____ GPD
Restaurant, less than 24 hr operation:	25 gallons/seat =	_____ GPD
24 hr operation:	50 gallons/seat =	_____ GPD

Hotel/Motel: 150 rooms x 100 gallons per room = 15000 GPD

Exhibit 7 continued:

Schools:

Day, restrooms, gym and cafeteria:	25 gallons/person	=_____ GPD
Self Service Laundry:	200 gallons/machine	=_____ GPD
Commercial Laundry:	2 x 1000 gallons/machine	= 2000 GPD
Physician/Dental Office:	100 gallons/exam room	=_____ GPD
		= _____ GPD
	Total GPD	= 17000 GPD
	Divide by 300 gpd (1 ERU)	
	Total ERUs	= 57
Total Water Tap-in Fee	57 x $900	$ 51,300
Total Water Surcharge		$ 0
Total Sewer Tap-in Fee	57 x $500	$ 28,500
Total Sewer Surcharge	57 x $1270*	$ 72,390

* (570-Gateway Transport + $700 - Georgetown Surcharge)

TOTAL $152,190

Calculated by:_____

Date:_____

Exhibit 7 continued:

Project_____**Date:**_____

Location_____
Flow rates are determined by the water use standards.

Residential Use: Equivalent Residential Units (ERU)

Total number of single family homes	____ @ 300 gpd =_____ GPD
Total number of one bedroom apartments	____ @ 150 gpd =_____ GPD
Total number of two bedroom apartments	____ @ 200 gpd =_____ GPD
Total number of three bedroom apartments (4 or more units per parcel)	____ @ 300 gpd =_____ GPD
	Total GPD_____ Divide by 300 gpd (1 ERU) = Total ERUs_____

Commercial Use: Gallons Per Day (GPD)

Offices:	30 gallons/200 sq. ft. =____ _ GPD
Department Store/Retail:	5 gallons/100 sq. ft. = _____ GPD
Restaurant, less than 24 hr operation:	25 gallons/seat = _____ GPD
24 hr operation:	50 gallons/seat = _____ GPD
Hotel/Motel:	100 gallons per room = _____ GPD
Schools:	
Day, restrooms, gym and cafeteria:	25 gallons/person = _____ GPD
Self Service Laundry:	200 gallons/machine = _____ GPD
Commercial Laundry:	1000 gallons/machine =_____ GPD
Physician's Office:	100 gallons/exam room = _____ GPD
Dental Office	150 gallons/chair = _____ GPD
Clinic	150 gallons/exam room = _____ GPD

Nursing Home
Barber Shop/Beauty Parlor

100 gallons/chair = _____ GPD

Total GPD = _____ GPD
Divide by 300 gpd (1 ERU)

Total ERUs =_____

Total Water Tap-in Fee $_____

Total Water Surcharge $_____

Total Sewer Tap-in Fee $_____

Total Sewer Surcharge $_____

TOTAL $_____

Calculated by:_____

Date:_____

Exhibit 8

Fire Protection Design Requirements

This exhibit must be submitted for all private development projects that will be served by the City of Savannah public water system within the Corporate Limits of the City.

PROJECT_____**DATE:**_____

LOCATION_____

WILL THE PROJECT INCLUDE A SPRINKLER SYSTEM? YES____ NO____

If yes, the system must be designed in accordance with NFPA 13, and the following additional question must be answered:

WILL THE SPRINKLER SYSTEM INCLUDE A BOOSTER PUMP OR THE USE OF CHEMICALS? YES____ NO____

If yes, a reduced pressure zone (RPZ) type backflow preventor must be installed on the water service lateral that will supply the system, in accordance with the City of Savannah's specifications and details.

1. NEEDED FIRE FLOW (NFF):

The Needed Fire Flow (NFF) for a proposed facility must be calculated in accordance with the Insurance Services Office (ISO) "Fire Suppression Rating Schedule", current edition.

The ISO calculation to determine the NFF for a proposed facility considers the construction, occupancy, exposure, and communication of a building or fire division as follows:

A. Construction Factor (C):

The portion of the NFF attributed to the construction and area of the proposed building is determined by the following formula:

$C = 18 * F * (A)^{0.5}$, where

F = Coefficient related to the class of construction:

= 1.5 for Construction Class 1 (Frame)
= 1.0 for Construction Class 2 (Joisted Masonry)

= 0.8 for Construction Class 3 (Non-combustible) and
Construction Class 4 (Masonry Non-combustible)
= 0.6 for Construction Class 5 (Modified Fire Resistive) and
Construction Class 6 (Fire Resistive)

A = Effective area

Note: Refer to the ISO Fire Suppression Rating Schedule for a detailed description of how to calculate the Construction Factor when the building Construction Class is mixed.

Class of Construction Factor (F): _____

Effective Area (A): _____ **square feet**

Calculated Construction Factor (C): _____ **gallons/minute (gpm**)

B. Occupancy Factor (O):

The portion of the NFF attributed to the occupancy of the proposed building is determined by the following factors:

Occupancy Combustibility Class	**Occupancy Factor (O)**
C-1 (Non-combustible)	0.75
C-2 (Limited Combustible)	0.85
C-3 (Combustible)	1.00
C-4 (Free Burning)	1.15
C-5 (Rapid Burning)	1.25

Occupancy Factor (O): _____

C. Exposures (X) and Communication Factors (P):

The portion of the NFF attributed to exposed and communicating buildings shall be determined in accordance with ISO Fire Suppression Rating Schedule.

Exposure Factor (X): _____

Communication Factor (P): _____

D. Calculation of Needed Fire Flow (NFF):

The Needed Fire Flow (NFF) for the facility shall be calculated using the following formula:

$$NFF = C * O * (X+P)_i$$

$$(X+P)_i = 1.0 + \sum_{i=1}^{n} (X_i + P_i), \text{ maximum } 1.75, \text{ where } n = \text{number of}$$

sides of subject building.

Calculated Needed Fire Flow (NFF): _____ gpm

2. AVAILABLE FIRE FLOW (AFF):

The Available Fire Flow (AFF) must be calculated based on hydrant flow testing and supplemental hydraulic analyses. The AFF will represent the fire flow that is available from the public water system at the existing or proposed hydrant nearest to the proposed facility at a residual pressure of 20 psi.

The following formula, which was developed by the ISO, can be used to adjust data from a hydrant flow test to determine the available fire flow at that location at 20 psi:

$$Q_{20} = Q_t * \frac{(P_s - P_{20})^{0.54}}{(P_s - P_t)^{0.54}}, \text{ where}$$

Q_{20} = Available fire flow at a residual pressure of 20 psi (gpm)
Q_t = Hydrant flow during test (gpm)
P_s = Static pressure measured before hydrant flow test (psi)
P_{20} = 20 psi (desired residual pressure)
P_t = Residual pressure measured during hydrant flow test (psi)

Note: The City of Savannah will provide one hydrant flow test at a location selected by the design consultant for no charge, which can be used as the basis for this calculation.

Hydrant Flow Rate During Test (Q_t): _____gpm

Static Pressure Before Flow Test (P_s): _____psi

Residual Pressure During Flow Test (P_t): _____psi

Calculated Available Fire Flow (AFF): _____gpm

3. HYDRANT DISTRIBUTION:

The hydrant distribution in the vicinity of a proposed facility must be sufficient to ensure that the NFF can be delivered. A credit will be applied for each existing or proposed hydrant based on the following ISO criteria:

DISTANCE FROM THE HYDRANT TO THE PROPOSED FACILITY (FEET)[?]	FIRE FLOW CREDIT (GALLONS/MINUTE)
0 to 300	1,000
301 to 600	670
601 to 1,000	250

? The distance from the hydrant to the proposed facility must be measured as the fire hose can be laid by apparatus (i.e., along roads and driveways as a vehicle would drive). Only 50 feet of the distance can be cross-country where the fire hose would be laid by hand at the hydrant.

HYDRANT DISTRIBUTION SUMMARY FOR PROPOSED FACILITY

DISTANCE FROM THE EXISTING AND PROPOSED HYDRANT TO THE PROPOSED FACILITY (FEET)[?]	FIRE FLOW CREDIT (GALLONS/MINUTE)
TOTAL CREDIT (GALLONS/MINUTE):	

Calculated by:_____

Date:_____